

CLAIMS

1. A light-emitting diode characterized by comprising:  
an electron implanting electrode, that is, an n-electrode;  
5        a hole implanting electrode, that is, a p-electrode; and  
      an inorganic light-emitting layer which is disposed between the n-electrode  
and the p-electrode so as to contact these electrodes and which is formed of an  
ambipolar inorganic semiconductor material.
2. The light-emitting diode according to claim 1, characterized in that  
10        in the ambipolar inorganic semiconductor material, a ratio of mobility  
between electrons and holes is in a range of 1/100 to 100.
3. The light-emitting diode according to claim 1, characterized in that  
      in the ambipolar inorganic semiconductor material, each mobility of the holes  
and the electrons at room temperature is  $10^{-1}$  cm<sup>2</sup>/Vs or more.
- 15        4. The light-emitting diode according to claim 1, characterized in that  
      the ambipolar inorganic semiconductor material has a dopant concentration of  
0.1% or less.
5. The light-emitting diode according to claim 1, characterized in that  
      a thickness of the inorganic light-emitting layer is 10 nm or more and 10 μm  
20        or less.
6. The light-emitting diode according to any one of claims 1 to 5,  
characterized in that  
      the ambipolar inorganic semiconductor material has a group II-VI compound,  
or Zn and at least one element selected from the group consisting of S, Se and Te.
- 25        7. The light-emitting diode according to any one of claims 1 to 5,  
characterized in that

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the ambipolar inorganic semiconductor material has a group III-V compound, or N and at least one element selected from the group consisting of Al, Ga and In.

8. The light-emitting diode according to any one of claims 1 to 5, characterized in that

5           the ambipolar inorganic semiconductor material includes, as the main component, carbon forming  $sp^3$  hybrid orbitals.

9. The light-emitting diode according to any one of claims 1 to 8, characterized in that

10           the n-type electrode includes a layer formed by use of an n-type inorganic semiconductor material in which an n-type dopant is diffused into the ambipolar inorganic semiconductor material.

10. The light-emitting diode according to any one of claims 1 to 8, characterized in that

15           the p-type electrode includes a layer formed by use of a p-type inorganic semiconductor material in which a p-type dopant is diffused into the ambipolar inorganic semiconductor material.

11. The light-emitting diode according to any one of claims 1 to 8, characterized in that

20           the n-type electrode includes a layer formed by use of an n-type inorganic semiconductor material in which an n-type dopant is diffused into the ambipolar inorganic semiconductor material, and the p-type electrode includes a layer formed by use of a p-type inorganic semiconductor material in which a p-type dopant is diffused into the ambipolar inorganic semiconductor material.

25           12. The light-emitting diode according to any one of claims 1 to 8, characterized in that

a material of a portion contacting the light-emitting layer in at least one of the

n-type electrode and the p-type electrode is formed by use of a material substantially different from the material of the light-emitting layer.

13. The light-emitting diode according to any one of claims 1 to 12,  
characterized in that

5            an ambipolar inorganic semiconductor material is formed on a crystalline  
substrate or a glass substrate, and the n-electrode and the p-electrode are formed on the  
ambipolar inorganic semiconductor material so as not to contact each other.

14. The light-emitting diode according to any one of claims 1 to 12,  
characterized in that

10           the n-electrode or the p-electrode is formed on a crystalline substrate or a  
glass substrate, and an ambipolar inorganic semiconductor material is stacked thereon,  
and the p-electrode or the n-electrode is stacked thereon.